

# PROFILE AFV WEAPONS



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## AMX-30 Battle Tank

by R. M. Ogorkiewicz



# AFV/Weapons Profiles

Edited by **DUNCAN CROW**

The AMX-30 is France's battle tank. Its most unusual feature is its main armament which consists of a 105mm gun firing a unique type of armour-piercing shaped charge projectile. The shaped charge is mounted in ball bearings. In this way the outer body of the projectile can be allowed to spin without causing the shaped charge to rotate at more than 20 to 30 revolutions per minute. At this rotational speed the shaped charge does not lose any of its armour-piercing performance, which is the drawback of spin-stabilized projectiles – their spin being imparted by the rifling of the guns from which they are fired. On the other hand the fact that the outer body is spinning means that the projectile retains a high degree of accuracy. It is the lack of spin in the alternative, fin-stabilized projectiles fired from smooth bores that reduces their accuracy, particularly at long range. Thus the *Obus G* has the best of both worlds: accuracy because the outer projectile spins; high armour-piercing performance because the shaped charge doesn't spin to any significant extent.

This is the eighth AFV/Weapons Profile to describe a modern battle tank that is equipping armies of today. The others are Nos. 18, 19, 23, 24, 28, 45 and 50. Still to come are Profiles on the Japanese Type 61 and ST-B, and on the Centurion which is certainly one of the most enduring battle tanks of all time as the fourth Arab-Israeli War has shown. There will also be a Profile on the MBT70 and XM803, which although they equip no army make a fascinating chapter in tank history.

The AMX-30 is R. M. Ogorkiewicz's ninth Profile. The others are Nos. 28, 34, 39, 42, 44, 45, 50 and 56.

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*Production version of the AMX 30 battle tank*

# AMX 30 Battle Tank

by R. M. Ogorkiewicz

AT FIRST sight the AMX 30 looks like most other battle tanks of the 1960s and 1970s. On closer inspection, however, it proves to differ from its contemporaries in several important respects. In fact, its design embodies a number of novel ideas which make it one of the most interesting of modern battle tanks.

The attributes of the AMX 30 are in keeping with the distinguished record of the development of tanks in France. This goes back to the very first tanks, which were developed in France at the same time as in Britain, and over a period of nearly sixty years has produced many novel designs. It has also produced the term "battle tank", or *char de bataille*, which was first used in 1921 to describe one of two tanks the French Army intended to develop after the First World War, the other being a very heavy tank.

## ORIGINAL CHAR DE BATAILLE

The heavy tank idea did not make much progress beyond the completion of ten 68-ton 2C tanks which were conceived before the end of the war in 1918. On the other hand the requirement for the *char de bataille*, which was re-defined in 1926, led to one of the most remarkable tanks ever built, the *char B*. This was a 31-ton vehicle armed with a 75mm gun which was mounted in the front of the hull so that it could be moved in elevation but not in azimuth in relation to the hull. In consequence, the gun was traversed on to a target by turning the whole vehicle which was done by the driver/gunner using a double-differential steering system with a hydrostatic steering drive.

The steering system and the semi-fixed gun mounting of the *char B* both represented remarkably advanced

design concepts. In fact, more than 30 years had to pass before other tanks were built with steering systems as sophisticated as that of the *char B*. As for the semi-fixed gun mounting, no other tank has yet been built with it, although there is now one tank with a completely fixed gun mounting, the S-tank developed in Sweden since 1956.

In some respects the *char B* was too far in advance of its day and it lacked some of the features which have made the S-tank so successful. In particular, it lacked the integrated driving and gun controls which make the S-tank so simple to operate. Thus, by the time it was produced in quantity in the 1930s, the *char B* was overtaken by other tanks so far as its overall effectiveness was concerned. To improve it, the semi-fixed mounting of the

*Char B1 of the thirties, built to the original requirement for a char de bataille.*





ARL 44, the transitional model built at the end of the Second World War.

75mm gun was abandoned, so that on the final *char B1 ter* version the gun could be not only elevated but also traversed, over an arc of 10 degrees, independently of the hull. The changes introduced in the *B1 ter* were not sufficient, however, to transform a brilliant concept into a really successful tank. Moreover, only five *chars B1 ter* were built before the French Army was defeated in 1940.

#### ARL 44

The occupation of France which followed the defeat of 1940 interrupted the development of French tanks. But clandestine studies continued under the German occupation and led to the design of a new battle tank which was built after the liberation of France in 1944. The new tank was called ARL 44 after the Atelier de Rueil and was first built in 1946. It weighed 48 tons and was powered by a 700 hp. engine which gave it a maximum road speed of 40 km./hour. Its main armament consisted of a turret-mounted 90mm gun capable of firing armour-piercing projectiles with a muzzle velocity of 1000 m/s. In all this the ARL 44 was comparable to other contemporary tanks but in other respects it was inferior to them. In fact, it retained several features of a design which was proposed in 1940 but which was never built, the ARL 40. For instance, its track layout, which resembled that of the *char B*, was distinctly old-fashioned by the standards of the late 1940s.

The ARL 44 could only be regarded, therefore, as a stop-gap vehicle, to be produced pending the development of another, thoroughly modern tank and it was, in fact, called a *char de transition*. Three hundred were originally ordered but in the end only 60 were built, which was just sufficient to equip one tank regiment, the 503rd. But, even as a temporary substitute, the ARL 44 did not prove entirely satisfactory and in the early 1950s it was withdrawn from service.

#### AMX 50

The stop-gap nature of the ARL 44 was emphasised by the fact that even before the first one was built work started on a much more modern and more powerful battle tank, the AMX 50. Work on the AMX 50 started as early as March 1945, that is two months before the end of the war in Europe. It was developed as part of the French Army's post-war re-equipment programme which called for only one battle tank in addition to two other armoured vehicles, an air-transportable light tank and a wheeled armoured reconnaissance vehicle. The French Army's policy of developing only one battle tank differed from the contemporary policies of the British, the United States and the Soviet Armies which continued to develop two categories of battle tanks, namely medium, or medium gun, and heavy, or heavy gun, tanks. It was, however, a sounder policy and proved to be so when, during the 1950s, the other armies also concentrated their efforts on a single type of battle tank.

The specification which led to the AMX 50 was strongly influenced by the characteristics of the two outstanding German tanks of the latter part of the Second World War, the Panther and the Tiger. Both these tanks were closely studied by French engineers who aimed at producing a tank which would be as mobile as the Panther and, at the same time, at least as well-armed as the Tiger. Thus, the AMX 50 was armed with guns of 90, 100 and finally 120mm and was powered by a 1000 hp. Maybach fuel-injection spark-ignition engine which grew out of a model intended for German tanks. The design of the AMX 50 also followed German tanks in such matters as the overlapping arrangement of its torsion bar sprung road wheels and in using a ZF gearbox similar to that of the Panther.

However, the AMX 50 also incorporated some highly original features. In particular, it had an oscillating, or

trunnion-mounted, turret which had not been used before in any battle tank. This type of turret consisted of two parts, the upper part being mounted on trunnions in the lower part. The gun was fixed in the upper part and was elevated or depressed with it, which greatly simplified fire control equipment and the installation of an automatic loading mechanism, since there was no relative motion between them and the gun mounting.

The design of the AMX 50 was carried out at the Atelier de Construction d'Issy-les-Moulineaux, the French Army's armoured vehicle development centre, from whose initials and its target weight of 50 tons its designation was derived. The first was completed by the end of 1949. It was still armed with the same 90mm gun as the ARL 44, but by July 1950 another prototype was built armed with a 100mm gun. A second prototype with a 100mm gun was built shortly afterwards but in 1951 it was decided to abandon the 100mm gun in favour of an even more powerful 120mm gun. Thus, one of the three AMX 50 chassis was fitted with a new, larger turret mounting the 120mm gun, which had already been installed in a turretless, assault gun version of the AMX 50 built in prototype form in 1950.

Like the 90 and 100mm guns, designed by the Arsenal de Tarbes the 120mm gun developed by the Atelier du Havre fired conventional armour-piercing projectiles with a muzzle velocity of about 1000 m/s. Armed with it the AMX 50 became comparable to the contemporary

U.S. M103 (originally T43) and British Conqueror heavy tanks. It was, therefore, as powerful as any tank of its period and a production of about 100 was envisaged for 1956. However, the AMX50 was never put into production, mainly for financial reasons. An additional factor was a waning enthusiasm for very heavy tanks. This happened not only in France but also in Britain and in the United States where the Conqueror and the M103 were only produced in small quantities. Moreover, the French Army's immediate need for more modern tanks than the United States-built M4 mediums with which it was still equipped was met by the delivery of several hundred M47 medium tanks under the U.S. Military Aid Programme.

### EUROPEAN TANK

When the AMX 50 was abandoned in the mid-1950s the French Army turned its attention to an entirely different type of battle tank, the AMX 30. This stemmed from a requirement arrived at in 1956 by the French General Staff in collaboration with the German and Italian Army Staffs. The joint Franco-German-Italian requirement was drawn up in an attempt to rationalize the development of weapons for the defence of Western Europe and called for a well-armed but lighter and more mobile type of battle tank than those which had been developed since the end of the Second World War in France, Britain and the United States. In fact, the new "European tank" was

*Turretless version of the AMX 50 with a 120mm gun.*



*AMX 50 battle tank with a 100mm gun.*





*AMX 50 battle tank with a 120mm gun.*



*AMX 50 battle tank with a 120mm gun and a lowered hull.*

*Seventy-ton version of the AMX 50 with 120mm gun.*



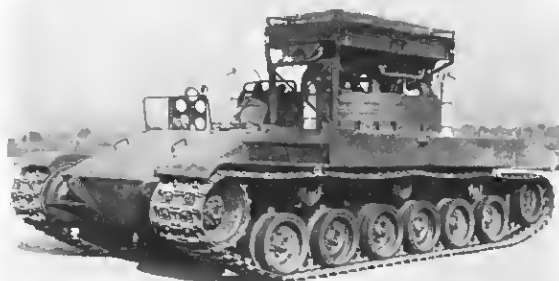
to weigh only 30 tons. This meant that it could not be heavily armoured. However, heavy armour was no longer considered to be as important as it had been because of the progress made in the development of anti-tank guided missiles and other weapons with shaped charge warheads which could perforate the thickest steel armour.

In addition to the relatively light weight of 30 tons the specification for the "European tank" agreed in 1957 by the French and German Armies called for a low silhouette and a high power-to-weight ratio, as well as a 105mm gun. From this basis the two armies proceeded in 1958 to design and then to construct prototypes from which a single European tank was to have been chosen, although in the event France and Germany each adopted its own design.

In France the design and development of the new battle tank was entrusted to the Atelier de Construction d'Issy-les-Moulineaux, which completed the first two prototypes of the AMX 30 in 1960. Seven more experimental tanks were built by the spring of 1963 and in July of that year the French government decided to put the AMX 30 into production for the French Army.

### AMX 30 PROTOTYPES

The prototypes of the AMX 30 represented in many ways a striking contrast to their predecessor and to other contemporary tanks. To start with, the first two weighed only 32.5 tons, which made them lighter than any tank of comparable power. As well as being light they were also very compact. For instance, their overall width was only 3.1m, which could only be matched by one other battle tank, the Swiss Pz.61, and which implied easier transport by rail as it was within the international load gauge. What is more, the height of the AMX 30 was only 2.28m, measured to the turret roof. This is bettered by only one other turreted battle tank, namely the Soviet T-54 but at the expense of reducing the depression of its gun to only 4 degrees whereas the gun of the AMX 30 can be depressed



*Batignolles experimental battle tank chassis which preceded the development of the AMX 30.*

8 degrees, which is virtually the same as the maximum depression in other tanks.

In contrast to the AMX 50 and the other two vehicles of the previous generation, the AMX 13 and the Panhard EBR, the AMX 30 has been fitted with a conventional instead of an oscillating turret. The latter was found to suffer from several disadvantages which outweighed its advantages. In particular, it was very difficult to seal against radioactive dust or airborne chemical agents and against water during submerged crossing of rivers which the AMX 30 was expected to do. The oscillating type of turret also proved to be heavier and higher than conventional turrets and to provide less elevation for the gun mounted in it. In addition, it required a more powerful type of elevating gear and was potentially vulnerable to the jamming of its two parts. For all these reasons it was abandoned. It is worth noting that similar conclusions were reached elsewhere. Thus, following their successful introduction in French vehicles, oscillating turrets were incorporated in several United States tank designs, mainly because they facilitated the installation of automatic loading mechanisms. Experimental models of at least two of these tanks with oscillating turrets, the

*Prototype of the AMX 30.*







*Pre-production version of the AMX 30; note absence of thermal sleeve on gun barrel.*



*Pre-production version of the AMX 30.*

T54E1 and the T69, were actually built in the United States during the mid-1950s but none was ever put into production.

Unlike the earlier French armoured vehicles, the AMX 30 was also diesel powered. Prior to its development N.A.T.O. armies followed the policy that armoured vehicles should be powered by spark ignition engines, which were favoured after the Second World War because the demands of civilian peacetime economy made gasoline more readily available than diesel fuel in any emergency. As a result the prototypes of the AMX 30 were originally powered by a spark ignition engine, the SOFAM 12 GSds. This was a water-cooled, horizontally-opposed flat-twelve which developed 720 hp. In consequence the first two prototypes had a power-to-weight ratio of 22 hp. per ton, which was only exceeded several years later by the MBT-70, the experimental U.S.-German main battle tank.

However, by the time the AMX 30 began to be developed the N.A.T.O. armies finally recognised the advantages of using compression ignition engines in tanks. Thus, they abandoned their earlier policy but they did not adopt the obvious alternative of diesel engines. Instead they called for "multi-fuel engines". These were to operate on fuels ranging from diesel oil to gasoline, but they turned out to be diesels which are generally capable of operating on a wide range of fuels – given

some precautions whose elimination was the principal feature of the new generation of the so-called "multi-fuel" compression ignition tank engines.

Thus, in keeping with this change in policy, the development of the AMX 30 was accompanied by the development of a new, compression ignition engine. The new engine was developed by the Hispano-Suiza Diesel Division of S.N.E.C.M.A. and had the same output as the SOFAM spark ignition engine. At the same time it was not significantly different in size, which represented a considerable achievement because diesels have a lower specific output than spark ignition engines, and this made it possible to replace the earlier engines without undue difficulty. This was in fact done in the series of seven experimental tanks built by 1963, whose SOFAM engines were replaced by Hispano-Suiza engines.

### **GUN AND AMMUNITION**

The most unusual feature of the AMX 30 from the start has been its main armament. This consists of a 105mm gun which fires a unique type of armour-piercing shaped charge projectile, the *Obus à Charge Creuse de 105mm Modèle F1*, or OCC 105 F1, often referred to as the *Obus G*.

The *Obus G* stems from a decision taken in 1953 by the Direction des Études et Fabrications d'Armement





*Pre-production version of the AMX 30 during firing trials: circular port in side of turret allows ejection of spent cartridge cases.*

*Overhead view of a pre-production model showing the early type of louvres over the engine compartment.*



(D.E.F.A., since known as the Direction Technique des Armements Terrestre, or D.T.A.T.) to develop a projectile for tank guns which would exploit to the full the armour-piercing capabilities of shaped charges. Its development faced the problem that shaped charges contained in conventional projectiles lose much of their armour-piercing performance because of the spin imparted to the projectiles by the rifling of the guns from which they are fired. The alternative, fin-stabilised projectiles spin little if at all but they have been considerably less accurate, particularly at long range. What was needed, therefore, was a projectile in which, as in fin-stabilised projectiles, the shaped charge would not spin to any significant extent but which would at the same time retain the accuracy of the spin-stabilised projectiles.

These apparently conflicting requirements were reconciled by the development of the *Obus G* in which the shaped charge is mounted in ball bearings. The outer body of the projectile can, therefore, be allowed to spin so that it retains a high degree of accuracy, but the shaped charge within it does not rotate at more than 20 to 30 revolutions per minute which does not degrade its performance.

In fact, the OCC 105 F1 can penetrate solid steel to a depth of 360 to 400mm, which is sufficient to perforate the armour of any contemporary battle tank. Moreover, its armour-piercing performance, like that of other shaped charge projectiles, is independent of range. This, together with its small dispersion and a muzzle velocity of 1,000 m/s makes it effective against tanks at up to 3,000 metres.

The development of a projectile as sophisticated as the OCC 105 F1 inevitably took several years but in 1961 a satisfactorily high level of performance had been reached for it to be accepted for use in the AMX 30. As expected, it has proved more accurate at long ranges than the equivalent type of fin-stabilised shaped charge, or HEAT (High Explosive Anti-Tank) projectile developed in the United States for 105mm tank guns. At the same time it is more versatile than solid armour-piercing shot and more difficult to defeat than squash head, or HESH, projectiles. In fact, it could have been used almost as the only type of tank gun projectile. It represented therefore almost the ideal tank gun ammunition, because the elimination of the variety of rounds which are carried in tanks would relieve tank crews of the need to select the appropriate type of round under the stress of battle and would thereby greatly increase the effectiveness of tanks.

However, because of its cost and specialised nature the OCC 105 F1 was inevitably less efficient against unarmoured targets than a more conventional high explosive shell. A complementary high explosive round was therefore also developed and so was a phosphorus smoke round as well as an illuminating round and a practice, dummy round. But in contrast to other tanks the AMX 30 has not been provided with armour-piercing discarding sabot rounds, both because they were considered unnecessary and because they require rifling with a greater degree of twist than that adopted to suit the OCC 105 F1.

### TURRET ASSEMBLY

The service version of the AMX 30 crystallised in 1965 with the construction of two pre-production vehicles. These incorporated all the improvements introduced on the previous nine vehicles, as well as some additional

ones, and they were closely followed by production models the first of which was completed in June 1966.

Almost inevitably, the production version of the AMX 30 is heavier than the prototypes, although not to the same extent as some other tanks. In fact, it weighs 36 tons fully laden and it is still as light as any contemporary battle tank. Without its crew and ammunition it weighs 34 tons, of which approximately 10 is accounted for by the turret assembly.

The turret consists of a one-piece steel casting with well sloped sides which increase the effectiveness of its armour against attack by armour-piercing projectiles. In addition to the main armament of the 105mm gun there is alongside it a 12.7mm heavy machine-gun which is normally elevated with the gun up to a maximum of 20 degrees. However, there is provision for elevating it by itself another 20 degrees, that is giving it a maximum elevation of 40 degrees so that it can be used against helicopters as well as ground targets. There is also provision for replacing the 12.7mm machine-gun by a 20mm automatic cannon which would make the secondary armament of the AMX 30 even more effective. There is also a 7.62mm machine-gun mounted externally on the commander's cupola but aimed and fired from within it.

The commander's TOP 7 cupola offers exceptionally good all-round vision through a ring of 10 direct-vision periscopes and it also contains a x10 magnification binocular telescope for long range observation and target detection. The cupola is also provided with a counter-rotating mechanism so that the commander can bring the turret round to lay the gun on target without losing sight of it through unwanted rotation of the cupola. The commander also operates an optical range finder of the full-field coincidence or superposition type. This has a base of 2m and in addition to ranging can be used as a telescope to enable the commander to lay the gun by himself.

The gunner who, as in other tanks, sits in front of the commander, has a telescopic gun sight and two observation periscopes. Three more periscopes are provided for the loader/radio operator who occupies the left side of the turret. All this makes the AMX 30 exceptionally well provided with observation equipment and is in keeping with its high mobility. In fact, if it had not been as well provided with observation equipment as it is it could not have exploited its mobility to the full because the crew could not have observed well enough for it to move as fast as it can.

To improve its accuracy still further the 105mm gun is fitted with a magnesium alloy thermal sleeve which protects the 56 calibre long barrel from bending due to non-uniform cooling by side wind or heating by solar radiation. The gun can be fired at a rate of up to 8 rounds per minute and the ammunition supply for it consists of 50 rounds: 18 of these are in the turret bustle and four by the loader, the rest being stowed in the front of the hull, to the right of the driver.

The gun is elevated by means of a hydraulic jack and the turret traversed by a hydraulic motor which forms part of a control system developed for the Société d'Application des Machines Motrices (SAMM). Elevation and traverse are normally controlled by the gunner but the commander is provided with override controls so that he can, if necessary, fire the gun by himself. There is also a mechanical back-up system which can be used by the gunner.



*Assembly line of AMX 30 turrets.*

### **AUTOMOTIVE CHARACTERISTICS**

The hull of the AMX 30 is welded from castings and rolled plates and has an exceptionally well sloped glacis which makes an angle of no less than 70 degrees with the vertical. The sides of the hull underside are also sloped, at 24 degrees to the horizontal, for improved protection against mines.

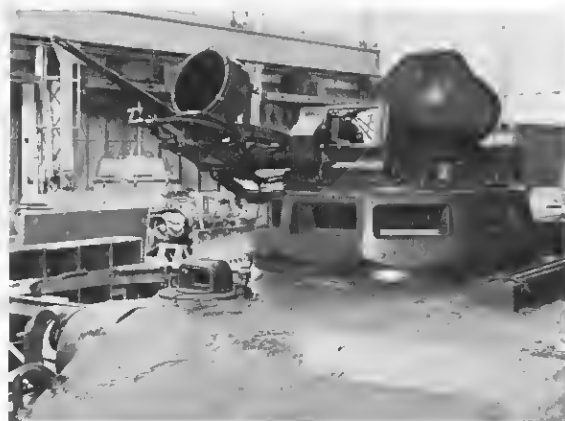
As in other tanks, the rear portion of the hull is occupied by the engine and transmission assembly, which can be replaced, if necessary, in 45 minutes. The engine is the HS-110 diesel which was developed by Hispano-Suiza but which is produced by SAVIEM, the heavy vehicle division of the Renault organization. It is a very compact, water-cooled engine with two horizontally-opposed banks of six cylinders and two exhaust gas turbine-driven superchargers. The twelve cylinders have a total swept volume of 28.8 litres out of which the engine develops 720 hp. at 2,600 revolutions per minute. In consequence, the AMX 30 has a power-to-weight ratio of 20 hp. per ton even when fully laden, and a maximum road speed of 65 km./hr.

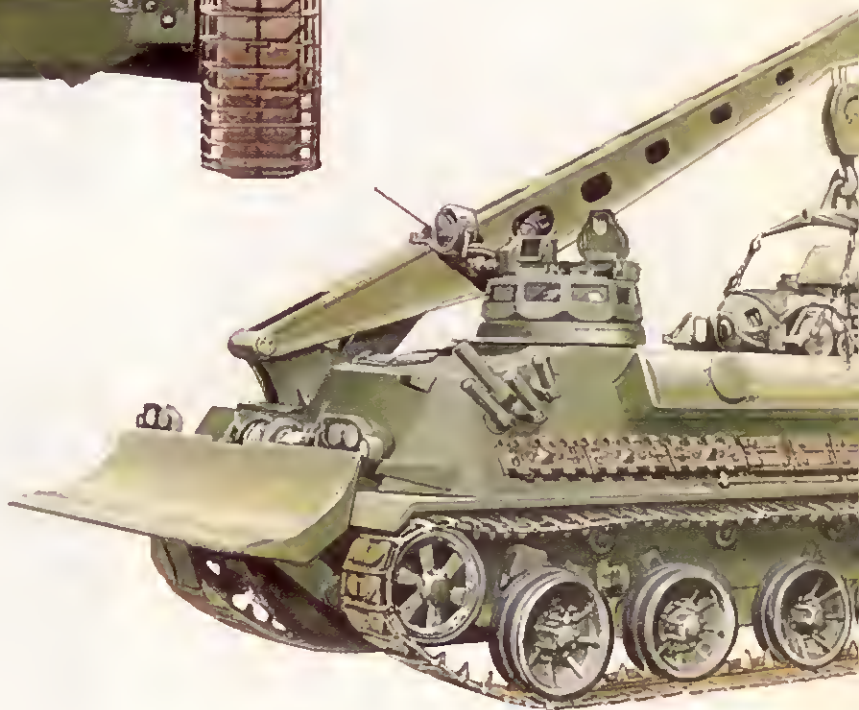
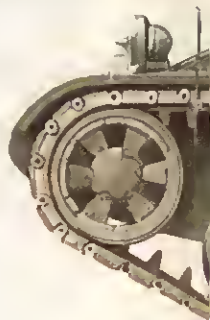
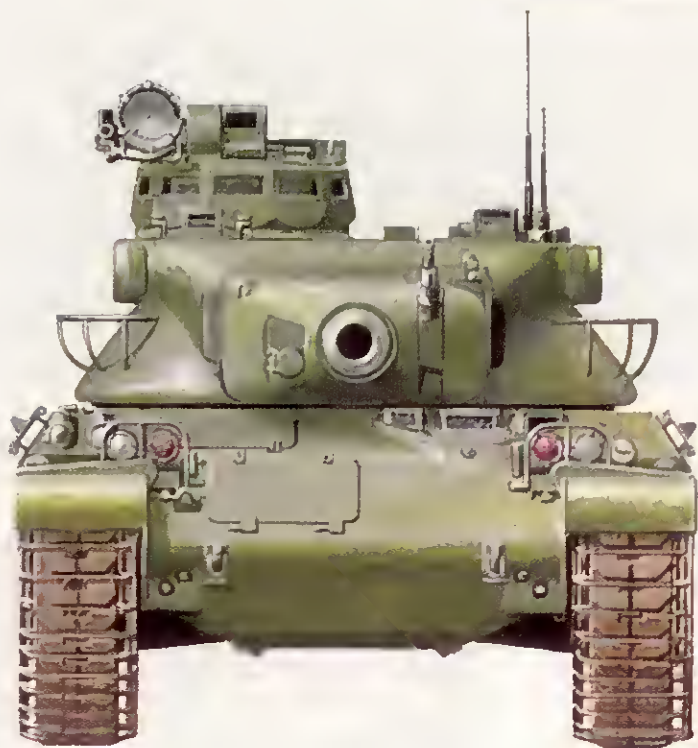
The engine is of the indirect-injection four stroke type which makes it efficient over a wide speed range. This, together with a total fuel tank capacity of 970 litres, gives the AMX 30 a range of 500 to 600 km. on roads. Under varying combat conditions, when for 20 per cent of the time the tank may be assumed to operate on roads, 40 per cent off the roads, and for 40 per cent of the time to be stationary but with the engine running, the fuel is sufficient for 18 hours.



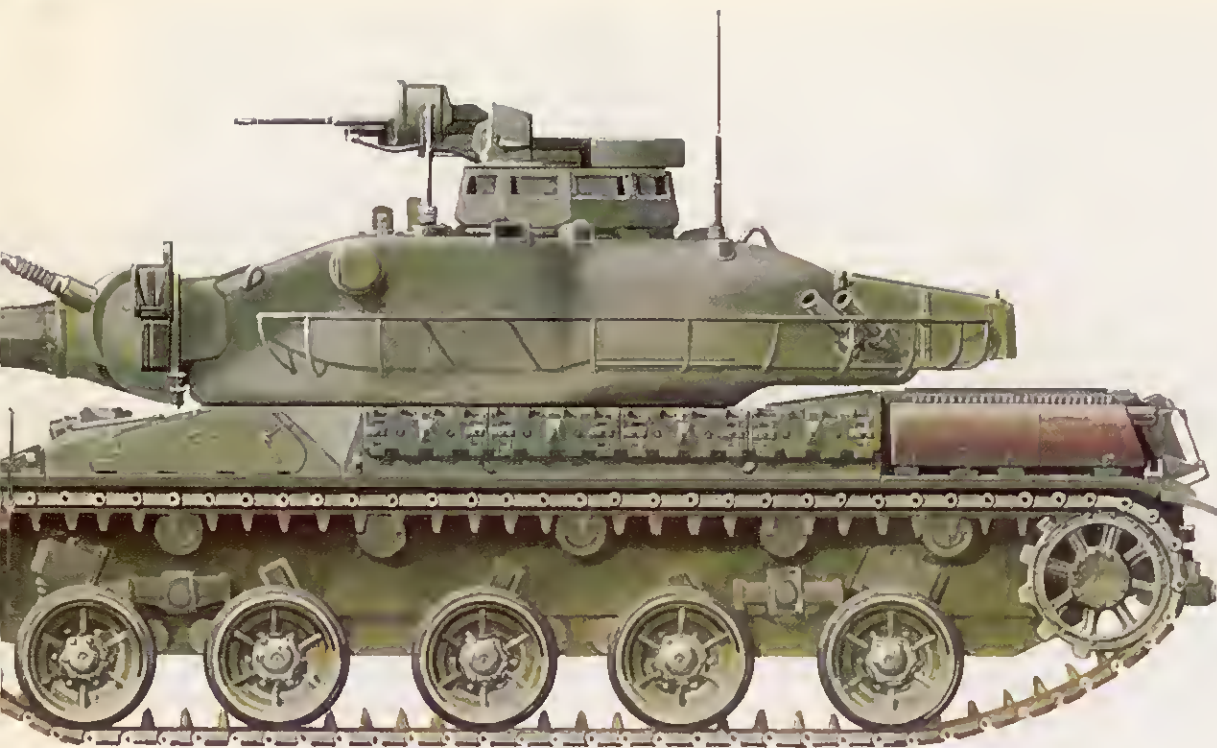
*Close up of gun mantlet showing the coaxial 20mm gun elevated beyond the maximum elevation of the 105mm gun.*

*TOP 7 commander's cupola on the production version of the AMX 30 battle tank.*









*Top and left: Side and front views of AMX 30.*

*Below left: AMX 30D armoured recovery vehicle — char AMX 30 depanneur-niveleur.*

*Below right: the anti-aircraft tank — AMX 30 bitube de 30mm.*

*T. Hadler © Profile Publications Limited*



The drive from the engine is taken through a Gravina twin-plate centrifugal clutch to an AMX gearbox. This provides 5 speeds forward and 5 in reverse and incorporates a triple differential steering system. Like other steering systems of this kind, that of the AMX 30 provides turning radii which vary with the propulsion gears, the lower the gear the smaller being the turning radius, which is generally required. Moreover, when the propulsion gears are in neutral the system causes the tracks to be driven in opposite directions so that the tank executes a pivot turn.

Each track of the AMX 30 consists of 83 steel links with plain steel connecting pins and detachable rubber road pads. The links are 570mm wide and in consequence the tracks exert a nominal pressure on the ground of only 0.77 kg./cm.<sup>2</sup>, which is as low as that of any contemporary battle tank. Moreover, the tracks have a life of 5,000 km. or more, depending on the terrain, which again compares very favourably with that of the tracks of other battle tanks.

The weight of the AMX 30 is transferred to the tracks by double, medium-size, rubber-tyred road wheels of which there are five on each side. The wheels are sprung by transversely mounted torsion bars and located by arms, the second and fourth being trailing, and the first,

third and fifth leading. The location of the first, third and fifth wheels on leading arms differs from most other torsion bar suspensions where all arms are trailing and torsion bars are, in consequence, spread at equal intervals across the hull. This is less efficient, in terms of internal space, than the arrangement adopted in the AMX 30 which has helped to keep its silhouette low.

To help keep down the unsprung weight and also the total weight of the vehicle, the road wheels are of aluminium alloy. The first and fifth wheels on each side are fitted with hydraulic dampers and on each side there are also five small rubber-tyred rollers to support the top run of the track.

Another interesting feature of the AMX 30 is its ability to cross water obstacles. Not only can it ford water 1.3m deep without any preparation but with very little preparation it can operate in water up to 2m deep, that is with only the top of the turret showing above the surface, and after the fitting of a schnorkel tube to the loader's hatch it can operate completely submerged in water up to 4m deep. Apart from the fitting of the schnorkel tube and simple checks, virtually all that needs to be done to permit submerged operation is the installation of blanking plates, which are normally carried on the front of the hull, over the engine compartment air

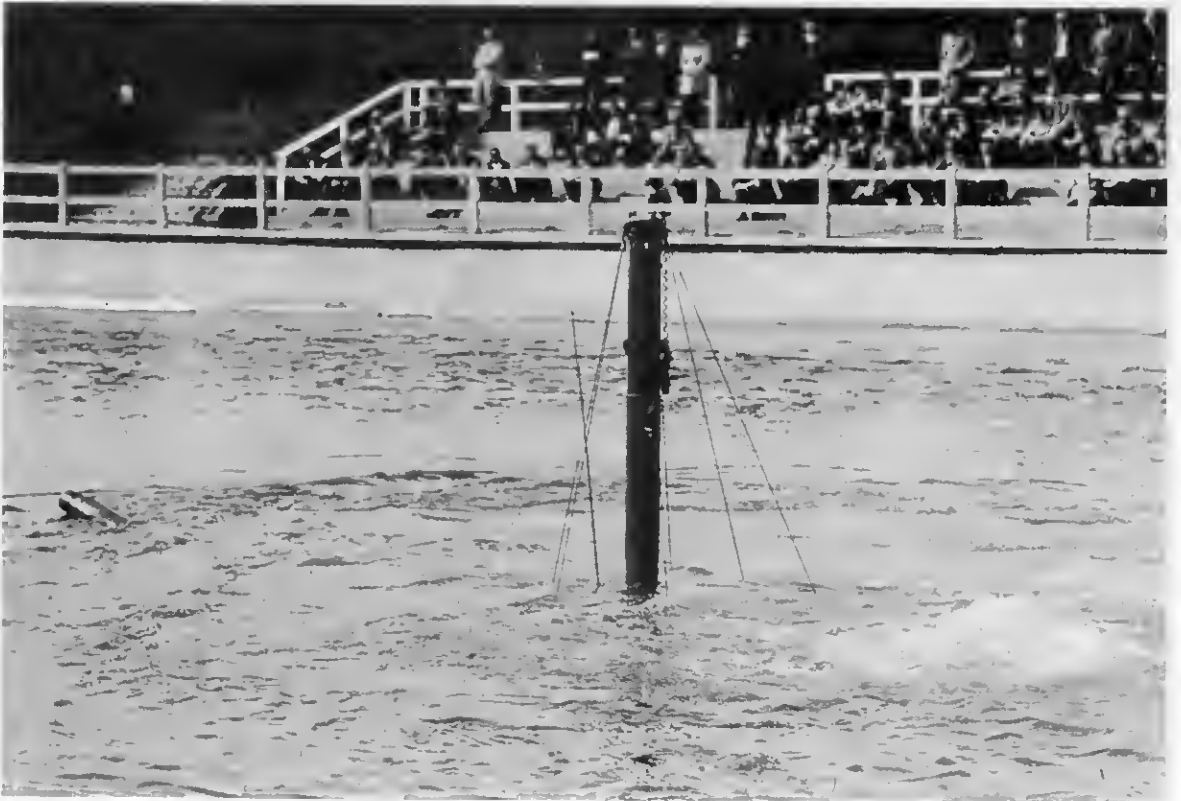
*Rear view of the production version of the AMX 30 battle tank.*





*Production version of the AMX 30 with a schnorkel tube for submerged fording.*

*AMX 30 moving under water with only the schnorkel tube and tip of gun barrel showing above the surface.*







*Assembly of an AMX 30 hull.*

intake louvres. Then, just before entering the water, the crew have only to inflate the turret ring, mantlet and cupola seals by means of an electrically driven compressor and to disengage the drive to the engine cooling fan.

### PRODUCTION

The final assembly of the AMX 30 has been carried out at the Atelier de Construction de Roanne. The town of Roanne where this plant of the D.T.A.T. is located is in the Massif Central, almost mid-way between the cities of Lyon and St. Etienne. The plant was built during the First World War to the plans of André Citroën for the production of artillery shells but since 1952 its activities have been concerned with armoured vehicles and before producing the AMX 30 it produced 1,900 vehicles of the AMX 13 series.

The original order for the AMX 30 placed in 1963 called for about 300 vehicles but it was planned from the outset to produce about 1,000 for the French Army alone and the eighth batch of 143 was in fact ordered in 1971. In addition to those built for the French Army, AMX 30 battle tanks have also been produced for the Greek Army, which adopted it to supplement its American-built tanks, and in 1972 the Venezuelan Army also ordered 142. Further AMX 30s have been ordered by the Spanish and Saudi Arabian Armies.

For export a somewhat simpler version has been offered as an alternative to the model produced for the French Army. This so-called "basic AMX 30" has a S.470 commander's cupola of the type originally fitted on the prototypes of the AMX 30, which is simpler and considerably lower than the TOP 7 cupola. To satisfy

users wedded to the bad traditions of United States tanks, the cupola carries an externally mounted 12.7mm machine-gun while the coaxial machine-gun is of 7.62mm calibre.

The "basic AMX 30" is also devoid of the infra-red searchlights and periscopes for observing and firing at night, and of the pressurised air filtering system for protection against radioactive dust and airborne biological or chemical agents. It also lacks a heater for the crew compartment but this, like the other equipment, can be fitted if required.

A considerably different version has been considered for future use by the French Army, namely one armed with a 142mm gun capable of firing ACRA guided missiles as well as high explosive projectiles. This would have given the French Army a tank somewhat similar but superior to the U.S. M60A2 battle tank armed with the 152mm gun/launcher. In particular, the ACRA missiles are supersonic infra-red beam riders and more advanced than the Shillelagh missiles fired from the U.S. 152mm gun/launcher. Moreover, both the ACRA missiles and the complementary high explosive rounds have conventional brass cartridge cases which means that they can be handled like conventional tank gun ammunition and are free of the problems which have bedevilled the U.S. 152mm gun/launchers with their combustible cartridge case rounds. However, for all its virtues, the development of the ACRA system was shelved in 1972 because of the inevitably high cost of its missiles.

In the meantime, several new features have been developed for the existing AMX 30 to improve its performance still further. These include stabilization of its 105mm gun in elevation and of the turret in azimuth



*Basic model of the production version of the AMX 30.*

*Frontal view of the basic model of the AMX 30.*





*Production version of the AMX 30 with sand shields.*

and, what is even more important, of a fire control system based on a laser range finder.

Several other vehicles have also been developed on the basis of the AMX 30. These include an armoured recovery vehicle, a bridgelayer, an anti-aircraft tank, a tactical nuclear missile launcher, and an experimental 155mm self-propelled gun.

### RECOVERY VEHICLE

The AMX 30 D armoured recovery vehicle, or *char AMX 30 dépanneur-niveleur*, has been developed to support AMX 30 battle tanks by towing any that might be disabled or pulling out of difficulties temporarily immobilised tanks, by replacing major assemblies, and by preparing passages for them, particularly during river-crossing operations. To enable it to do all this, the recovery vehicle has been fitted with a powerful winch, a crane and a bulldozer blade.

The winch is driven by the vehicle's engine through a torque converter and can exert a pull of up to 35 tons. Its heavy cable is 80m long and to haul it out there is an auxiliary winch which has a 120m long cable and can exert a maximum pull of 4 tons. The auxiliary winch can, of course, also be used whenever the nature of the recovery operation does not call for the main winch.

The crane is hydraulically operated and can lift loads of up to 13 tons over a sector of 240 degrees and 20 tons when working over the front of the vehicle: in the latter case it needs to be supported by removable props carried on the vehicle and the bulldozer blade needs to be lowered on to the ground to stabilise the vehicle. As a result, the recovery vehicle can not only lift a complete 3.29-ton engine and transmission assembly or the 10-ton turret assembly but it can even partly lift a complete AMX 30 tank.

The bulldozer blade, which is 3.14m wide, is also hydraulically operated and is used not only for earth-

moving or excavating but also as a ground anchor when heavy loads are winched or, as already indicated, when the vehicle needs to be stabilized for lifting heavy loads.

Apart from its special equipment the recovery vehicle consists essentially of the AMX 30 battle tank chassis with a fixed superstructure instead of the gun turret. Its laden weight is normally the same as that of the battle tank, namely 36 tons, but when it carries a replacement engine-transmission assembly, for which there is a special frame above its own engine compartment, its weight reaches 40 tons.

The crew of the recovery vehicle consists of four men: commander, driver and two mechanics. The driver sits higher and further forward than in the battle tank and his compartment contains all the vehicle controls. The commander is located behind the driver and is provided with the same TOP 7 cupola as the commanders of battle tanks, which gives him excellent all-round vision, and a 7.62mm machine-gun for close-in defence of the vehicle. The two mechanics sit behind the commander.

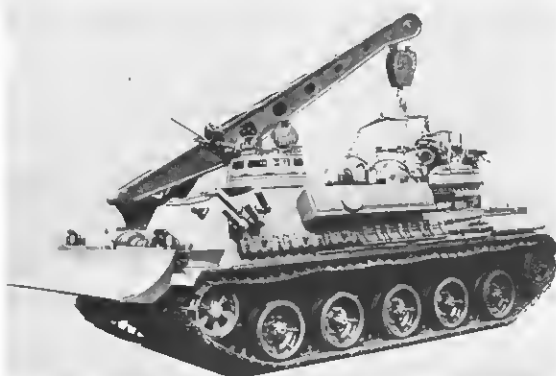
The crew of the recovery vehicle are provided with the same nuclear, biological and chemical (NBC) protection as the crew of battle tanks and its automotive performance is virtually the same as that of the battle tanks. This means that it is highly mobile and when fitted with a schnorkel tube over the mechanics' hatch it can ford rivers submerged.

### BRIDGELAYER

The AMX 30 bridgelayer, or *poseur de pont*, consists of a standard battle tank chassis with a box-like superstructure instead of the gun turret, supports for carrying a scissors-type folding bridge, and a hydraulically operated mechanism for laying and retrieving the bridge over the rear of the vehicle. When unfolded the bridge is 22m long, which enables it to span gaps 20m or, when the banks are hard, 21m wide. The width of the bridge is



*Armoured recovery vehicle version of the AMX 30.*



*AMX 30 recovery vehicle with its crane raised to lift an engine and transmission assembly.*



*AMX 30 bridgelaying vehicle with bridge in travelling position.*



*AMX 30 anti-aircraft tank.*



*AMX 30 with S 401 A turret mounting two 30mm automatic guns and fire control radar.*

Apart from being heavier as well as 4.29m high and 11.5m long, when carrying the bridge, the bridgelaying tank has much the same performance as the AMX 30 battle tank from which it was derived and it can, therefore, operate over the same type of terrain.

#### **ANTI-AIRCRAFT TANK**

Development of the turret assembly of the AMX 30 anti-aircraft tank which gives it its special characteristics antedates that of the AMX 30 battle tanks. This is due to the foresight of the French Army which, like the Soviet Army, continued to develop self-propelled anti-aircraft guns for defence against low-level attacks at the time when other armies had unwisely neglected them. Its development was focussed on twin Hispano-Suiza 30mm 831 A automatic guns coupled to an *Oeil-noir* fire control radar which were installed in a SAMM S 401 A turret and this was mounted on an AMX 13 light tank chassis – the only suitable armoured vehicle chassis available to the French Army at the time.

The combination of the S 401 A turret with the AMX 13 chassis represented a significant advance on all earlier self-propelled anti-aircraft guns and in March 1962 the French General Staff decided to put it into production. Quantity production actually began in 1967 and the AMX 13 anti-aircraft tank came into service as the *Bitube de 30mm Anti-aerien Automoteur*.

However, production of the AMX 30 provided another chassis on which the S 401 A turret could be mounted and this resulted in an even better mobile anti-aircraft weapon system. To start with, the automotive characteristics of the AMX 30 chassis are greatly superior to those of the AMX 13. As it is twice as heavy as the AMX 13, the AMX 30 also provides a much more stable platform for the guns. Most important of all, perhaps,

3.10m but this can be increased to 3.95m by the use of additional panels.

The bridge has a class 50 rating which means that it can normally carry tracked vehicles of up to 40 tons and with special care of up to 46 tons. It can also carry wheeled vehicles with a load per axle of 16 tons. The bridge itself weighs 7.25 tons. Widening panels and central flooring panels weigh another 1.35 tons and bring the weight of the bridgelaying tank with the bridge to 42.6 tons.

The bridgelaying tank is manned by a crew of three, those additional to the driver being the commander and the bridge operator both of whom are located in the superstructure. The operator controls the laying and recovery of the bridge by himself and either operation can be accomplished in about 10 minutes. If necessary this can be done with all the hatches closed and as the bridgelaying tank is provided with NBC equipment similar to that of the battle tanks it can be used to lay bridges even in contaminated areas.

the AMX 30 can carry much more ammunition: 1,200 rounds, in fact, which is twice the number of rounds carried by the AMX 13 anti-aircraft tank.

The guns are normally used to fire bursts of one, 5 or 15 rounds each, at a cyclic rate of fire of 650 rounds per minute per gun. They are controlled by an electronic analogue computer from the basis of information about the range of the target fed by a Doppler radar and about the motion of the target provided by the gunner visually tracking it. Prior to being used for determining the range of the target, the radar is used for surveillance and for detecting the direction of the target, the second phase of the target acquisition being optical. When not in use the radar aerial can be neatly folded down into an armoured box at the back of the turret to protect it from accidental damage. This also reduces the overall height of the vehicle from 3.8m to 3m.

As it depends on visual tracking, the fire control system is only of the "clear weather" type but adequate, nevertheless, for dealing with the most likely form of low level aerial attack and is very much simpler and less expensive than any alternative "all-weather" system. The crew of the *AMX 30 bitube de 30 mm* consists of only three men. They are the commander who controls the first phase of target acquisition, and the gunner, who controls the second phase and fires the guns, both of whom sit in the turret, and the driver. The chassis differs from that of the other vehicles of the series in housing a small generator set which makes it possible to operate the turret without running the main engine.

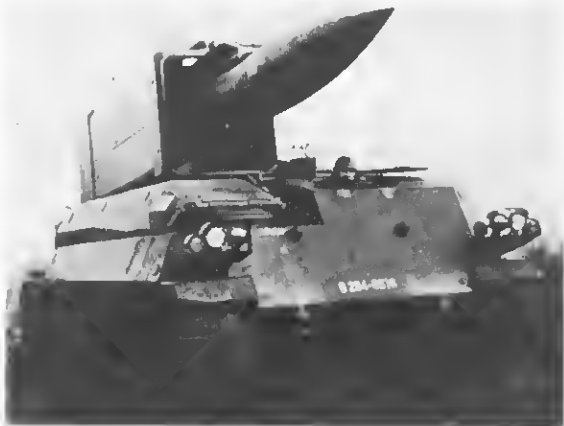
*Service version of the AMX 30 Pluton missile launcher.*

*Prototype of the AMX 30 Pluton tactical nuclear missile launcher.*

## MISSILE LAUNCHER

In addition to having a better appreciation than most other armies of the importance of anti-aircraft tanks, the French Army has also recognised the need for suitable mobile launchers for tactical nuclear missiles, in contrast to the U.S. Army and others equipped with American tactical missiles. The only army which has been ahead of the French in this respect is the Soviet Army which has developed a series of tracked missile launchers based on tank chassis.

The French Army's answer to the need for a mobile tactical missile launcher has been, once again, to choose the chassis of the AMX 30 and to modify it to carry the container/launching ramp of the Pluton surface-to-surface tactical nuclear missile. The missile weighs 2.4 tons and is 7.6m long; it has a simplified inertial guidance system and a solid propellant rocket motor which gives it



a maximum range of 120 km., while its minimum range is 10 km. It can be fired with a minimum of preparation and the vehicle on which it is mounted has the same mobility as the AMX 30 battle tanks. The launcher, or *vehicule de tir Pluton*, can operate therefore in close support of armoured units. To help it in this the four-man crew of the AMX 30 Pluton launcher are provided with the same type of NBC protection as the crew of AMX 30 battle tanks.

### SELF-PROPELLED GUN

Powerful as they are, Pluton and similar nuclear missiles have not eliminated the need for more conventional artillery support. In consequence yet another weapon system has been developed on the basis of the AMX 30. This is the *canon automoteur de 155 GCT*, a 155mm gun mounted in a special large turret on a standard AMX 30 battle tank chassis. The gun is 40 calibres long and is provided with an automatic loading mechanism which enables it to fire at a rate of 8 rounds per minute to a maximum range of 23.5 km.

The turret in which the 155mm gun is mounted has all-

round traverse and allows the gun to be elevated up to 66 degrees. Ammunition carried in the vehicle for the gun consists of 42 rounds with combustible cartridge cases and fully laden it weighs 38 tons. Its crew consists of four men, three of whom are located in the turret and all of whom are provided with the same type of NBC protection as the crews of the other vehicles of the series. In several other respects the 155mm self-propelled gun also resembles the other vehicles of the AMX 30 family.

### SUMMARY OF THE LEADING CHARACTERISTICS OF THE AMX 30 BATTLE TANK

Gun, calibre	105mm
length	56 calibres
ammunition	50 rounds
Machine-gun, coaxial	12.7mm
external	7.62mm
Weight, net (in travel order)	34,000 kg.
combat loaded	36,000 kg.
Length, overall, gun forward	9.48m
vehicle only	6.59m
Height, to turret roof	2.28m
to top of cupola telescope	2.85m
Width, overall	3.10m
Ground clearance	0.44m
Width of tracks	0.57m
Nominal ground pressure	0.77 kg./cm. <sup>2</sup>
Engine, model	HS 110
gross horse power	720
Maximum road speed	65 km./hr.
Range, on roads	500-600 km.
Crew	4

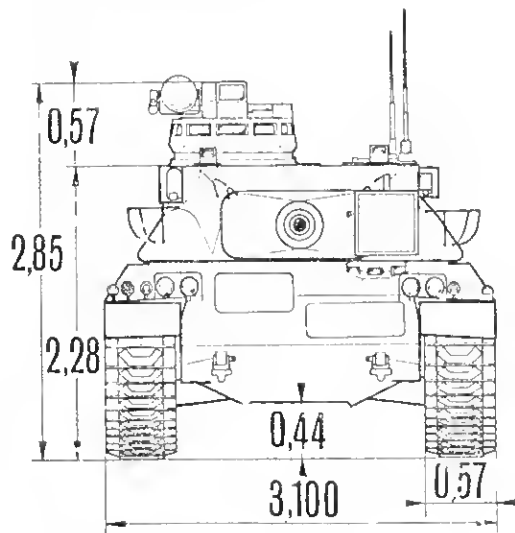
### Acknowledgements

The author wishes to thank the Directors of the Atelier de Construction d'Issy-les-Moulineaux for information about the history and characteristics of the AMX 30 and for making it possible for him to examine it, on more than one occasion.

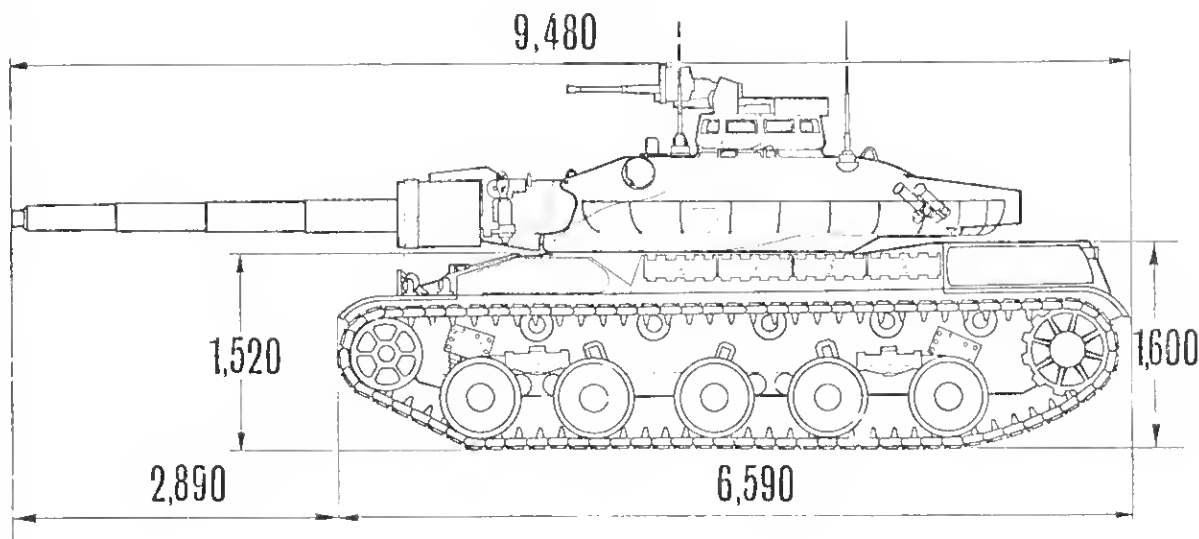
The author also wishes to thank the Directors of the Atelier de Construction d'Issy-les-Moulineaux, the Technical Director of the Direction Technique des Armements Terrestres and the Military Attachés at the French Embassy in London for their generous help with photographs.

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Front and side drawings of the AMX 30 production model showing its overall dimensions.





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*by Colonel Robert J. Icks*

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## **The M551 Sheridan**

*by Colonel Robert J. Icks*

Although the Sheridan was intended to replace both the M41 Light tank and the M56 Self-propelled gun, it was not intended as a light combat tank but rather as a light reconnaissance vehicle having sufficient firepower to participate in an airborne assault. Its weapon was a new gun/launcher nicknamed the Shillelagh. It served in Vietnam – with mixed results.

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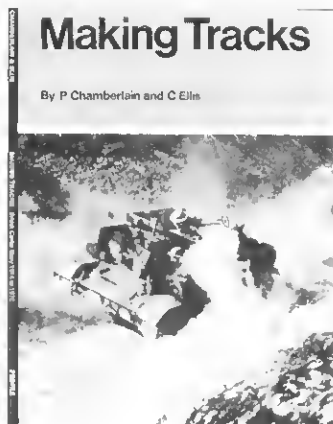
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